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MORTALITY OF OVERWINTERING EGGS OF THE BLACK-HEADED BUDWORM AND HEMLOCK SAWFLY IN SOUTHEAST ALASKA

by

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INTRODUCTION

The black-headed budworm, *Acleris variana* (Fern.), and the hemlock sawfly, *Neodiprion tsugae* Midd., both overwinter as eggs. Budworm eggs are laid singly on the flat surface of needles of western hemlock, *Tsuga heterophylla* (Raf.) Sarg., and Sitka spruce, *Picea sitchensis* (Bong.) Carr. Sawfly eggs are deposited singly in notches cut into the edge of western hemlock needles. Fall egg surveys are used to predict budworm and sawfly populations for the following season. Egg mortality between deposition and hatching must be known in order to make accurate population predictions. A study of winter egg mortality was begun in 1962 and completed in 1965. Field work was done at Limestone Inlet near Juneau, Alaska.

METHODS

Each sample tree was numbered. Tags locating budworm or sawfly eggs were lettered alphabetically. Fine wire or nylon string was used to attach small plastic tags to the bases of egg-bearing twigs. If a tag was lost, the budworm or sawfly eggs represented by the tag were deleted from the sample.

Egg-bearing twigs were tagged in October of 1962, 1963, and 1964. Tagged twigs were examined monthly from November until the following June, when the eggs hatched.

Only the lower crowns of western hemlock were sampled during the first year (1962-1963). A 10-foot magnesium stepladder permitted sampling

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to a height of about 16 feet. Four steel towers erected in 1963 made it possible to sample the upper crowns during the following 2 years (fig. 1).

RESULTS AND DISCUSSION

The percent mortality of overwintering budworm and sawfly eggs is shown in table 1. Some loss of budworm eggs occurred each month, but the greatest losses were recorded after heavy snowfalls when eggs and tags were swept away by sliding clumps of snow and ice. This removal is believed to be the major factor in loss of overwintering budworm eggs.

In addition to loss of budworm eggs by physical removal, some dried and shriveled eggs failed to hatch in the spring. Such failure to hatch could be caused by infertility.

Mortality of sawfly eggs was caused by failure to hatch following drying of the egg-bearing needles due to oviposition or other injury. When the needles dried, the eggs upon them also dried and failed to hatch. The eggs are deeply embedded so mechanical abrasion or removal is unlikely.

The total loss of overwintering budworm eggs, as shown in table 1, varied from 22 to 32 percent. Thirty-four percent of the sawfly eggs failed to hatch. Egg mortality for both species is approximately 30 percent. Parasitization by the egg parasite, *Trichogramma minutum* Riley, when present, should also be considered. This species may destroy up to 25 percent or more of budworm eggs in southeastern Alaska, although distribution is usually spotty. 1/

1/ Unpublished data on file at the Northern Forest Experiment Station, Juneau, Alaska.

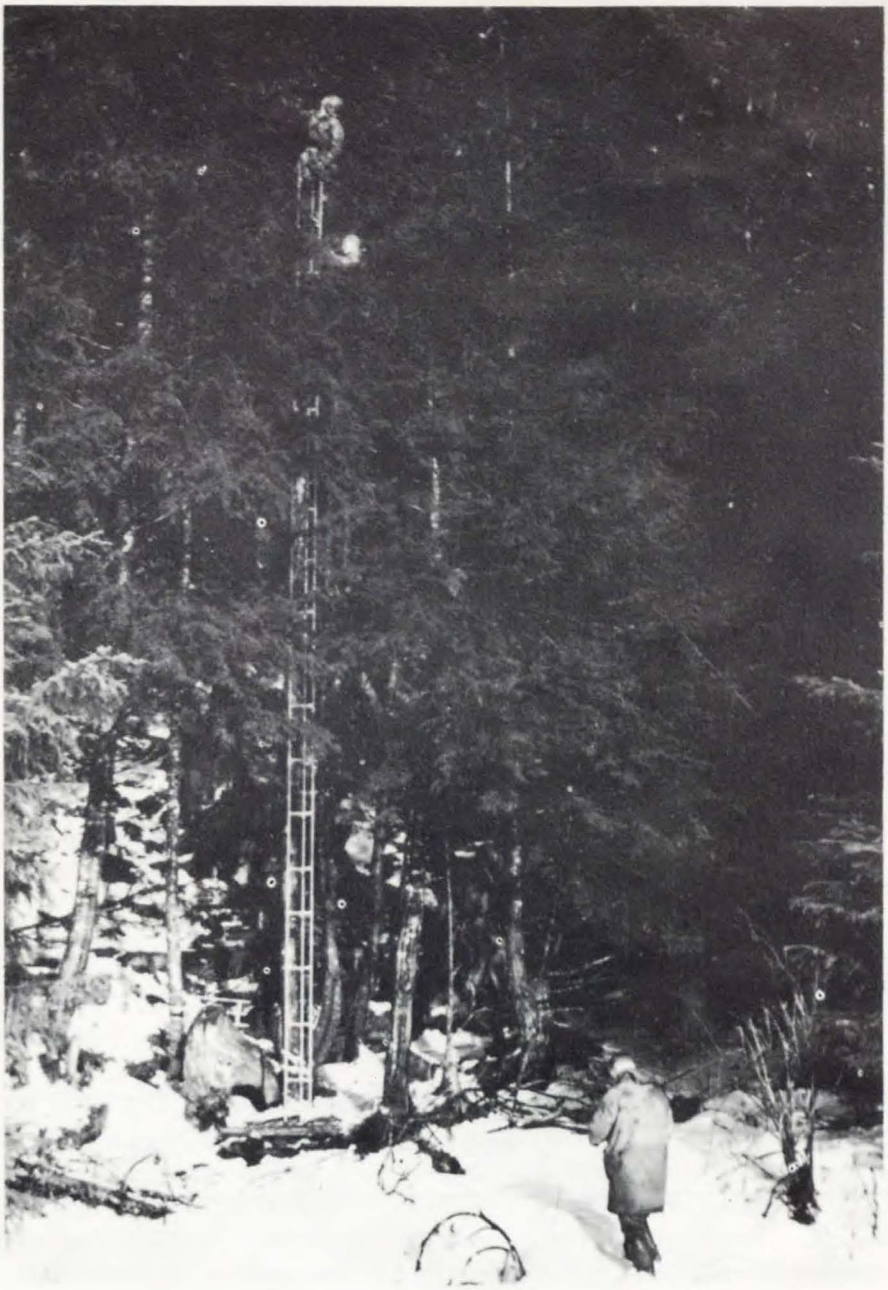

Figure 1.--Examining overwintering budworm and sawfly eggs in the upper crowns of western hemlock trees by means of a steel tower.

Table 1.--Mortality of overwintering eggs of the black-headed budworm and hemlock sawfly, Limestone Inlet, Alaska

BLACK-HEADED BUDWORM

Year	Part of crown sampled	Eggs tagged	Egg mortality		
			Lost	Failed to hatch	Total
		Number	Percent	Percent	Percent
1962-1963	lower crown	600	22	4	26
1963-1964	lower crown	600	16	6	22
	upper crown	228	19	12	31
1964-1965	lower crown	276	21	8	29
	upper crown	616	24	8	32
HEMLOCK SAWFLY					
1964-1965	entire crown	895	0	34	34

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